Appl. No. 10/620,518
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In response to the Office Action dated March 23, 2005

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**AMENDMENTS TO THE CLAIMS**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims**

Claims 1-10 (canceled)

Claim 11 (original): A method of forming a silicon nitride layer for a bottle-shaped trench process, comprising:

providing a silicon substrate;

forming a trench in the silicon substrate;

conformally depositing a dielectric layer in the trench;

selectively etching the dielectric layer, exposing an upper region in the trench and sidewalls thereof, leaving a lower region in the trench covered by the remaining dielectric layer;

performing an ion implant process, implanting nitrogen atoms into the silicon substrate adjacent to the sidewalls;

performing a thermal nitridation process, forming a silicon nitride layer on the surface of the sidewalls, wherein the silicon nitride layer includes the silicon nitride formed on the silicon surface by reaction of the silicon surface with the nitrogen atoms therein;

removing the remaining dielectric layer from the lower region of the trench; and

using the silicon nitride layer as an etching mask, etching the silicon substrate in the lower region, forming an expanded region therein, and forming a bottle-shaped trench consisting of the trench portion in the upper region and the expanded region in the lower portion.

Claim 12 (original): The method as claimed in claim 11, wherein the silicon nitride layer further comprises the silicon nitride formed by reaction of the silicon surface with a nitrogen-containing gas in the thermal nitridation process.

Claim 13 (original): The method as claimed in claim 11, wherein the dielectric layer is silicon dioxide.

Claim 14 (original): The method as claimed in claim 11, wherein the method for depositing the dielectric layer is LPCVD or liquid phase deposition (LPD).

Claim 15 (original): The method as claimed in claim 11, wherein the method as claimed in claim 1, wherein the source gas for the ion implant process is nitrogen ($N_2$).

Claim 16 (original): The method as claimed in claim 11, wherein the implant energy for the ion implant process is between 200 eV and 200 KeV.

Claim 17 (original): The method as claimed in claim 11, wherein the implant dosage for the ion implant process is between $1*10^{14}$ atoms/cm$^2$ and $5*10^{17}$ atoms/cm$^2$.

Claim 18 (original): The method as claimed in claim 11, wherein the thermal nitridation process is a furnace nitridation process or a rapid thermal nitridation (RTN) process.

Claim 19 (original): The method as claimed in claim 11, wherein the process temperature of the thermal nitridation process is between 500°C and 1200°C.

Claim 20 (original): The method as claimed in claim 11, wherein the etching method for forming the expanded region is wet etching.

Claim 21 (original): The method as claimed in claim 11, wherein the expanded region is wider than the trench in the upper region.

Claim 22 (original): The method as claimed in claim 11, wherein the process gas for the thermal nitridation process is $NH_3$, $N_2$, $N_2O$ or NO